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**TEXTRON** Defense Systems

Textron Defense Systems/  
Subsidiary of Textron Inc.

2385 Revere Beach Parkway  
Everett, MA 02149  
617/389-3000

4 November 1991

Naval Research Laboratory  
Attn: Mr. Barry Feldman, Code: 6540  
4555 Overlook Avenue, SW  
Washington, DC 20375-5001

Subject: Contract No. N00014-91-C-2279  
Monthly Progress Report - October 1991

Dear Mr. Feldman:

In accordance with the 91-C-2279 contract, \*Textron Defense Systems (TDS) hereby forwards one copy of the subject report. Additional distribution has been made to the offices set forth below, per Enclosure 1 of the DD Form 1423.

Very truly yours,

Textron Defense Systems

*C. T. Christiano*

C. Thomas Christiano  
Manager of Contracts

CTC/hga  
3730D  
Enclosure

cc: Director  
Naval Research Laboratory  
ATTN: Code 4827  
Washington, DC 20375-5000, (1 copy)

✓ Defense Technical Information Center  
Bldg. 5, Cameron Station  
Alexandria, VA 22314, (4 copies)

Defense Contract Management Area Operations  
495 Summer Street, Boston, MA 02210-2184  
Attn: GFACB-23/Mr. David Noyes  
Administrative Contracting Officer, (1 copy)

**91-15222**



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Laser Frequency Multiplication  
Report for October 1991, Contract No. 00014-91-C-2279

The available Lumonics TEA CO<sub>2</sub> lasers (gain lengths 40 cm and 120 cm) have been mounted on an optical table and preparation of the mode-locked, line-selected output has begun. The 0.5  $\mu$ sec TEA laser pulse was considered to be too short for effective mode-locking so its pulser was modified into a simple three-element PFN to give 3  $\mu$ sec excitation. Single transverse mode operation was obtained with the 40 cm device in a folded 6m optical cavity, giving an output energy of 0.5 J in a Gaussian spot of parameter  $\omega=0.46$  cm. A continuous - wave CO<sub>2</sub> laser was grating tuned to 9.55  $\mu$ m and injected at the 0.1 watt level into the pulsed oscillator in order to frequency lock its output and at the same time suppress the gain-switched "spike". This exercise was successful, even without using a mode-matching lens of 5 m focal length which is on order. Suppression of the gain-switched spike is important for our study of harmonic conversion efficiency.

The output envelope at this point is unacceptably erratic, possibly due to air movement in the resonator beam path. Further effort will be made to improve the output reproducibility.

A 12.5 MHz germanium crystal modulator was inserted into the cavity to obtain preliminary 9.55  $\mu$ m, TEM<sub>00</sub> mode-locked pulse trains, of total duration 3  $\mu$ sec and with 40 nsec between individual pulses. Further mode-locking work will be done when the output power of the laser has been made more constant.

A 35 mm type I AgGaSe<sub>2</sub> crystal has been ordered from Cleveland Crystals, to be cut and coated for frequency doubling from 9.55  $\mu$ m to 4.775  $\mu$ m. A quotation is being sought on a type II mixing crystal to give 3.183  $\mu$ m, following the doubling process. The type I crystal is scheduled for delivery by Dec. 15.

Malcolm McGeoch 10/31/91

Statement A per telecon Barry Feldman  
NRL/Code 6540  
Washington, DC 20375-5000

NWW 11/19/91



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